DRIVING SYSTEM FOR A SEPARATOR

[0001] The invention relates to a driving system for a separator, according to the preamble of Claim 1.

[0002] Driving systems of this type are known in many different arrangements, for example, from German Patent Document DE 37 14 627, which shows an arrangement in which a centrifugal drum is placed on the upper free end of a driving spindle which is rotatably disposed below the centrifugal drum by means of an upper neck bearing and a lower footstep bearing on a drive housing or its supporting elements.

[0003] With respect to the state of the art, International Patent Document WO 98 / 5 77 52 A1, German Patent Document DE 34 32 833 A1, and British Patent Document GB 255,437, which is more removed with respect to its type and discloses bearing supports on spherically shaped surfaces, as well as German Patent Document DE 175341 C and Patent Document AT 110574 are also mentioned.

[0004] The driving motor may be arranged below the actual driving spindle or by way of a belt drive laterally offset thereto. In this arrangement, the upper neck bearing is resiliently supported on the drive housing. During precession movements or the like of the driving spindle, it can therefore carry out its radial movement together with it.

[0005] In the axial direction, the weight of the centrifugal drum is supported by way of the footstep bearing on the drive housing. In the radial direction, the footstep bearing is fixed on the drive housing.

[0006] A comparable arrangement is known from German Patent Document DE 844 233, in which, for ensuring the radial mobility, one of the bearings is supported in the upward direction in a type of ball bearing surface.

[0007] It is also known from German Patent Document DE 62 687 to support the drum weight below the neck bearing.

[0008] The use of angular ball bearings for the bearing of driving spindles is known, for example, from Swiss Patent Document CH 484 873. From this document, it is also known to implement the supporting of the bearing in the radial direction relative to the drive housing by means of rubber elements.

[0009] From German Patent Document DE 1 031 222, it is also known to support the drum weight below the footstep bearing axially in a type of universal ball joint.

[00010] With respect to the state of the art, German Patent Document DE 31 25 832 as well as European Patent Document EP 0 131 494 and German Patent Document DE 34 32 833

A1 are also indicated. The latter document again shows the use of angular ball bearings as well as the arrangement of universal ball joints for supporting the driving spindle above the footstep bearing.

[00011] In comparison to German Patent Document DE 37 14 627, which indicates the state of the art of the above-mentioned type, the invention has the task of implementing a driving system for separators with a vertical centrifugal drum which can be produced in a cost-effective manner and is characterized by a good machine-dynamic behavior.

[00012] The invention achieves this task by means of the object of Claim 1.

[00013] Accordingly, while retaining the radially resilient support of the neck bearing on the machine housing, the latter is constructed as an angular ball bearing which supports the centrifugal drum in the downward direction on a spherical supporting surface of the machine housing. The selected type of support of the centrifugal drum can be implemented in a particularly cost-effective manner. As a result of the construction, an excellent machine-dynamic behavior is also implemented because it presents no problem to machine-dynamically uncouple the motor from the bearing system of the driving spindle or the centrifugal drum. In this manner, for example, a direct drive, a drive by way of a transmission or by way of a pulley are conceivable.

[00014] The center point of the spherical-surface-shaped supporting surface is preferably situated in the area os the footstep bearing, particularly in its center. The rotating point of the precession movement is therefore advantageously placed on an axial position of the driving spindle, in which the latter is supported by way of the footstep bearing.

[00015] On the inside and upwards, the neck bearing is preferably supported on the driving spindle, and, downward toward the outside, it is preferably supported on an outer neck bearing ring.

[00016] The neck bearing ring can, in turn, have a spherical construction on its underside and can rest on a complementarily spherical-section-type-shaped bearing collar of the drive housing. In this manner, by means of particularly few components, the spherical-surface-shaped support of the centrifugal drum required according to the main claim is cost-effectively implemented by way of the neck bearing on the machine housing.

[00017] It presents itself to construct a gap between the outer circumference of the neck bearing ring and the inner circumference of the drive housing. In this gap, the arrangement of a spring for the radially resilient supporting of the neck bearing on the machine housing can be implemented in a simple manner.

[00018] It is particularly expedient in this case for a sealing and spring ring to bridge the gap. In this case, a particularly cost-effective implementation possibility of the spring element consists of an O-ring which is arranged in a groove on the outer circumference of the neck bearing ring, from which it projects radially to the outside. The supporting is also implemented in a very simple manner in a radial direction by means of the O-ring. The rubber material assists the frictional damping on the spherical surface by means of the characteristics inherent to it.

[00019] The above-mentioned preferred embodiments supplement one another, on the whole, to a simple construction of the driving system with a minimal number of parts and the advantageous measure of the axial drum seat accommodation in the upper bearing. In this case, an automatic frictional damping takes place by means of the drum weight (by means of the force caused by the drum weight, the neck bearing ring rubs axially on the machine housing or machine frame). Thus, the drive is designed such that, in the case of heavy centrifuges, more damping is generated than in the case of lighter centrifuges.

[00020] The above-mentioned arrangement can preferably be supplemented by the measure that the supporting surface of the neck bearing ring on the drive housing is in an operative connection with a lubricating system for lubricating the neck bearing, so that the lubrication which is to be provided anyhow or the lubricating system for lubricating the neck bearing can be utilized in a very simple manner for the lubrication of the supporting surface of the drive housing.

[00021] Advantageous further developments are indicated in the subclaims.

[00022] In the following, the invention is described in detail by means of an embodiment with reference to the drawing.

[00023] Figure 1 is a sectional view of a driving system (without showing the driving motor); and

[00024] Figure 2 is an enlarged cutout from Figure 1.

[00025] Figure 1 illustrates a driving system 1 for a separator with a vertical axis of rotation, which has a vertically aligned driving spindle 2 for a centrifugal drum which is not shown here and which in Figure 1 is placed on the upper conical end of the driving spindle 2.

[00026] For driving the driving spindle 2, the driving system comprises a motor which is not shown here and which, as an example, can directly downward by way of a coupling 18 arranged closely below the point of rotation M of the precession movement adjoin the

lower end of the driving spindle, or which drives the driving spindle 2 indirectly, for example, by way of a belt drive (also not shown here) and/or by way of a transmission.

[00027] The driving spindle 2 is disposed by means of a neck bearing 3 and a footstep bearing 4 in a bore-type opening 14 of a one-piece or multi-piece drive housing 5.

[00028] The neck bearing 3 is arranged to be axially rigidly or stationarily fixed and radially movable. In contrast, the footstep bearing 4 is arranged in a fixed manner in the drive housing 5 and is axially movably constructed as a movable bearing, a self-aligning ball bearing being used here.

[00029] According to Figures 1 and 2, the neck bearing is advantageously constructed as an angular ball bearing. In the area of the upper inner circumference (inner upper corner area), this angular ball bearing is supported on an upper stepping or a step 6 of the driving spindle 2 and in the diametrically opposite thus, the outer lower circumferential or corner area, on a lower stepping or a step 7 of a neck bearing ring 8 surrounding the angular ball bearing on its outer circumference.

[00030] Between the outer circumference of the neck bearing ring 8 and the inner circumference of the drive housing 5, a gap 9 is constructed, so that the spindle 2 can radially move with a slight play. The gap 9 is resiliently bridged by a sealing and spring ring 10 - here, a particularly cost-effective O-ring - which is arranged in a groove 11 on the outer circumference of the neck bearing ring 8 and from which groove 11 it projects to the outside. In a very simple fashion, the O-ring implements a radial supporting of the drum weight. In addition, the driving spindle 2 centers in the O-ring, so that the O-ring permits the radial movements of the driving spindle and of the neck bearing 3. Additional and/or alternative spring arrangements are conceivable but not absolutely necessary.

[00031] On its underside 12, the neck bearing ring 8 has a ball-socket type construction and rests on a bearing collar 13 of the drive housing 5 formed in a complementarily spherical-section-type manner (surface section of a ball with the radius R with the center point M in the area of the footstep bearing neck bearing 4. Thus, the neck bearing ring 8 because of the gap 9 around its circumference can be displaced with a corresponding play on the ball-socket-type bearing collar 13. In this manner, an axial absorption of the drum weight takes place by means of a few constructive devices in the upper bearing - the neck bearing 3. As a result, the center point M of the precession movement is also situated in the area of the footstep bearing 4, particularly in its center.

[00032] For implementing the lubrication system, a first bore 15 - a lubrication bore for a lubricant, such as oil or grease - leads into the area around the driving spindle 2 above the

neck bearing 3. The two bearings - the neck bearing 3 and the footstep bearing 4 - are connected by a duct 16 which, as a ring duct, here represents a portion of the bore 14. As a result, when oil is used as the lubricant, the two bearings can be lubricated jointly at low expenditures. The removal of the oil can take place in the downward direction (not shown here).

[00033] By means of the lubricating system for lubricating the neck bearing 3, a lubrication of the supporting surface of the driving surface on the spherical-section-type bearing surface 13 of the of the driving housing 5 also takes place directly below the neck bearing 3. In a supplementary manner, a second lubricating bore 17 for the footstep bearing 4 can guide grease directly to the footstep bearing.

Reference Numbers

Driving system	1
driving spindle	2
neck bearing	3
footstep bearing	4
drive housing	5
upper stepping	6
lower stepping	7
neck bearing ring	8
gap	9
sealing and spring ring	10
groove	11
underside	12
bearing collar	13
opening	14
first lubricating bore	15
ring duct	16
second lubricating bore	17
coupling	18